DRAFT

Idaho Radionuclide Exposure Study

Wayne A. Bliss, Director

Richard J. Guimond, Director
Office of Radiation Programs (ANR-458)

O'Neal
Guimond
Pble
Leach
SF-?

CONFIDENTIAL
EPA Region 10 Superfund
RELEASABLE
Date 11/16/16
Initial

Work on the draft report is proceeding. The introduction, summary of the literature review, and radon flux measurements sections have been drafted and are being reviewed.

AIRDOS computations have been completed for each plant and show the following:

Monsanto Soda Springs, ID

RISK	NUMBER OF PEOPLE	NUMBER OF PEOPLE AT THIS RISK OR HIGHER	DEATHS/YEAR AT THIS RISK	DEATHS/YEAR AT THIS RISK OR HIGHER
1.0E+00 TO 1.0E-01	0	0	0	0
1.0E-01 TO 1.0E-02	0	0	0	0
1.0E-02 TO 1.0E-03	0	0	0	0
1.0E-03 TO 1.0E-04	781	781	0.002	0.002
1.0E-04 TO 1.0E-05	3419	4200	0.001	0.003
1.0E-05 TO 1.0E-06	91135	95335	0.002	0.005
LESS THAN 1.0E-06	5291	100626	0.00006	0.005

RISK TO THE MAXIMUM INDIVIDUAL = 0.0003
THE TOTAL NUMBER OF DEATHS/YEAR = 0.005

DOSE TO ORGANS (MILLIREM) OF MAXIMUM INDIVIDUAL

GONADS	BREAST	R MAR	LUNGS	THYROID	ENDOST	REMAINDER	EFFECTIVE WHOLE BODY
0.06	0.06	0.31	109	0.06	4.0	0.96	13.6

FMC Pocatello, ID

RISK	NUMBER OF PEOPLE	NUMBER OF PEOPLE AT THIS RISK OR HIGHER	DEATHS/YEAR AT THIS RISK	DEATHS/YEAR AT THIS RISK OR HIGHER
1.0E+00 TO 1.0E-01	0	0	0	0
1.0E-01 TO 1.0E-02	0	0	0	0
1.0E-02 TO 1.0E-03	0	0	0	0
1.0E-03 TO 1.0E-04	8563	8563	0.02	0.02
1.0E-04 TO 1.0E-05	106494	115057	0.04	0.06
1.0E-05 TO 1.0E-06	58583	173640	0.007	0.07
LESS THAN 1.0E-06	0	173640	0	0.07

RISK TO THE MAXIMUM INDIVIDUAL = 0.0007
THE TOTAL NUMBER OF DEATHS/YEAR = 0.07

~~1.3.4-0002~~
2255 1.3.4-0003

DRAFT

DOSE TO ORGANS (MILLIREM) OF MAXIMUM INDIVIDUAL

GONADS	BREAST	R MAR	LUNGS	THYROID	ENDOST	REMAINDER	EFFECTIVE WHOLE BODY
0.01	0.01	0.22	214	0.14	1.7	2.6	26.6

Preliminary dose calculations for slag in the communities show the maximally exposed individual dose to be 330 and 190 millirem per year for Soda Springs and Pocatello respectfully. The average net community exposure from slag is 140 and 96 millirem per year. For the minmimally exposed population, i.e. those who do not work around slag and have no slag around or in their home, the doses are 34 and 24 millirem per year for Soda Springs and Pocatello respectively.

The maximally exposed individual for Pocatello can be estimated to receive:

airborne dose contribution	26.6 mrem
slag dose	190
for a total effective whole body dose of	216.6 mrem.

This dose equates to a risk of about 6×10^{-3}
(216.6 mrem/year x 74 years x 4×10^{-7} deaths/mrem).

The maximally exposed individual in Soda Springs can be estimated to receive:

airborne dose contribution	13.6 mrem
slag dose	330
for a total effective whole body dose of	343.6 mrem.

This dose equates to a risk of about 1×10^{-2}
(343.6 mrem/year x 74 years x 4×10^{-7} deaths/mrem).

ORP/LV-78-2 reported a house in Soda Springs which was 53 µR/hr above background. Using this value in the contractor's matrix where the occupant also worked around slag, e.g. on slag filled paving and also had slag in his driveway, his annual exposure would be 347.4 mrem or a risk also of about 1×10^{-2}. If this person did not work around slag, i.e. was a farmer who lived in a house built with slag, his dose would be about 215 mrem or a risk of 6×10^{-3}.

ORP/LV-78-2 also reported radon progeny levels indoors about 0.01 WL greater than background which relates to a risk of 1×10^{-2} (0.01 WL x 51.5 WLM/year x 74 years x 3.6×10^{-4} deaths/WLM x 0.75) for 75% occupancy or 5×10^{-3} for a person working outside the home who spends about 3,000 hours at home. The added insult due to radon may raise the risk 50 to 100%, however it is not the objective of this assess indoor radon and it is reported that phosphorus slag emits very little radon.

Any way you cut it, the risk from the phosphorus industries at Soda Springs and Pocatello for the potential maximally exposed individual is about 10^{-2} or greater. For the average resident of these towns, the risk is about 3 to 4×10^{-3}.

DRAFT

So what can EPA do about these risks?

The least impact option is to do nothing. The airborne exposure to the Pocatello population array used in AIRDOS is computed to be raising the death rate by 0.07 deaths per year in a population of 173,640. The annual lung cancer deaths would be expected to be 141 (assuming that 6% of the deaths are due to lung cancer and the life span is 74 years). The airborne exposure to the Soda Springs area is computed to be raising the lung cancer death rate by 0.005 per year. The expected lung cancer death rate is expected to be about 82. The average gamma exposure in Pocatello of 96 mrem from slag will increase the annual death rate by 6.5 (170,000 people x 4×10^{-4} deaths/rem x 96 mrem). The cancer death rate for other than lung cancer might be expected to be 378. (The surgeon general has reported 22.4% of all deaths in 1987 were due to cancer. I arbitrarily chose 6% due to lung cancer.) The average gamma exposure in Soda Springs of 140 mrem from slag will increase the annual death rate by 5.6 (100,000 people x 4×10^{-4} deaths/rem x 140 mrem). The non-lung cancer death rate might be expected to be 222. These two groups are not, however, exclusive. The intervening population is in both population groups used in the AIRDOS arrays which I have used here. The total deaths would be less than the sum of 6.5 and 5.6, perhaps about 7. More realistic is the computation using 50,000 for the population of Pocatello and 6,000 for Soda Springs which yield annual deaths of 2 and 0.3 respectively. These become relatively small when compared to the expected cancer death rates.

The second option would be to suggest to Idaho or pursue by regulation either by Idaho or EPA the prohibition of the use of elemental phosphorus slag in all construction. Such action would impact most heavily on those businesses who build using slag and increases in cost to consumers where slag now substitutes for limited local supplies of aggregate material. Slowly the source of exposure would diminish. The resultant average savings would be 2.3 deaths per year when all the slag is gone from the existing communities.

Thirdly and perhaps the most debatable option would be to pursue the threat of radiation exposure from slag as we would a threat from a hazardous chemical such as dioxin. The movement of slag into the environment would have to stop. Detailed assessments of location, quantity, and risk therefrom would begin as in a remedial investigation and feasibility study under Superfund. Our study should suffice as the site investigation and technical assessment. The aerial survey clearly identifies where the pollutant is. This option then branches out into when and how do we recover what slag. As you know it has been used widely as road bed material, paving aggregate and railroad ballast - as far away as Butte, Montana where streets are also paved with slag.

I will continue to develop these options. Obviously one plant violates our 25 mrem air standard as used for DOE facilities. Either we should require source abatement or consider a waiver for 100 mrem per year. This memo, when finished, will provide a basis for discussion to decide our ultimate course of action.